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Attorney Docket No. P18520

In re application of : Masakazu FURUKAWA et al.

Serial No. : 09/462,067 (National Stage of PCT/JP99/03086) Group Art Unit : 3742

I.A. Filed : June 9, 1999 Examiner : S. Paik

For : CERAMIC HEATER AND METHOD OF PRODUCING THE SAME ELECTRICALLY CONDUCTIVE PASTE FOR HEATING BODY

THE COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

Sir:

Transmitted herewith is an Appeal Brief 37 C.F.R. 1.192 in the above-captioned application.

___ Small Entity Status of this application under 37 C.F.R. 1.9 and 1.27 has been established by a verified statement previously filed.
___ A verified statement to establish small entity status under 37 C.F.R. 1.9 and 1.27 is enclosed.
___ An Information Disclosure Statement, PTO Form 1449, and references cited.
___ No additional fee is required.

The fee has been calculated as shown below:

Claims After Amendment	No. Claims Previously Paid For	Present Extra	Small Entity		Other Than A Small Entity	
			Rate	Fee	Rate	Fee
Total Claims: 21	*21	0	x 9=	$	x 18=	$ 0.00
Indep. Claims: 3	**3	0	x 42=	$	x 84=	$ 0.00
Multiple Dependent Claims Presented			+140=	$	+280=	$ 0.00
Appeal Brief Fee				$		$320.00
			Total:	$	Total:	$320.00

*If less than 20, write 20
**If less than 3, write 3

___ Please charge my Deposit Account No. 19-0089 in the amount of $_____.
_X_ A Check in the amount of $320.00 to cover the filing fee is included.
_X_ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 19-0089.
_X_ Any additional filing fees required under 37 C.F.R. 1.16.
_X_ Any patent application processing fees under 37 C.F.R. 1.17, including any required extension of time fees in any concurrent or future reply requiring a petition for extension of time for its timely submission (37 CFR 1.136)(a)(3).

Bruce H. Bernstein
Reg. No. 29,027

Reg No. 33,094

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Masakazu FURUKAWA et al.

Art Unit 3742

Appl. No.: 09/462,067 (National Stage of PCT/JP99/03086)

Examiner: S. Paik

Intl Appl. Filed: June 9, 1999

U.S. Appl. Filed: January 5, 2000

For: CERAMIC HEATER AND METHOD OF PRODUCING THE SAME AND ELECTRICALLY CONDUCTIVE PASTE FOR HEATING BODY

APPEAL BRIEF UNDER 37 C.F.R. 1.192

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

This Appeal is from the Examiner's Final Rejection of claims 1, 3-7 and 25-33 as set forth in the Final Office Action mailed from the U.S. Patent and Trademark Office on March 18, 2002.

A Notice of Appeal to the March 18, 2002 Final Office Action was filed August 19, 2002, whereby the initial due date for filing of the Appeal Brief is set to expire two months thereafter, or October 19, 2002. With October 19, 2002 being a Saturday, in accordance with 37 C.F.R. 1.7, the initial due date for filing the Appeal Brief is Monday, October 21, 2002. The requisite fee under 37 C.F.R. 1.17(s) of $320.00 for filing this Appeal Brief is being paid by check, enclosed herewith.

The Commissioner is authorized to charge any fee necessary for maintaining the pendency of this application, including any appeal fees and any extension of time fee that may be necessary, to Deposit Account No. 19-0089.

This Appeal Brief is being submitted in triplicate.

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1. REAL PARTY IN INTEREST

The real party in interest is Ibiden Co., Ltd. by an assignment which was recorded on January 5, 2000, at REEL 010635, FRAME 0995 for 3 pages.

2. RELATED APPEALS AND INTERFERENCES

Appellants are not aware of any other appeals or interferences which will directly affect or be directly affected by or have a bearing on the decision of the Board of Patent Appeals and Interferences in this pending appeal.

3. STATUS OF CLAIMS

The status of the claims is as follows:

Claims 1-7, 14-18 and 25-33 are pending in this application.

Claims 8-13 and 19-24 have been canceled in the Amendment Under 37 C.F.R. 1.116 filed September 4, 2002.

Of the pending claims:

Claims 1, 3-7 and 25-33 are under prosecution, and have been finally rejected in the Final Office Action mailed March 18, 2002..

Claims 2 and 14-18 are held withdrawn from further consideration by the Examiner as being directed to non-elected inventions and non-elected species. These claims are being permitted to remain pending subject to rejoinder upon allowance of the claims under appeal.

The claims which are under appeal, i.e., claims 1, 3-7 and 25-33, are reproduced in the APPENDIX attached hereto.

Moreover, for the convenience of the Board of Patent Appeals and Interferences (hereinafter "Board"), the non-elected claims, i.e., claims 2 and 14-18, are also included on separate pages of the APPENDIX attached hereto.

4. STATUS OF AMENDMENTS FILED SUBSEQUENT TO FINAL REJECTION

Appellants filed an Amendment Under 37 C.F.R. 1.116 on September 4, 2002 wherein, in addition to presenting arguments for patentability of the rejected claims and submitting a Declaration Under Rule 132 of Yasutaka Ito, Appellants canceled non-elected claims 8-13 and 19-24.

The Amendment Under 37 C.F.R. 1.116 was entered in an Advisory Action mailed September 26, 2002.

5. SUMMARY OF INVENTION

As disclosed in the specification, at page 2, beginning at line 24, the present invention relates in one of its aspects relates to the incorporation of ceramic material having excellent heat conductivity, particularly nitride ceramic or carbide ceramic, as a substrate for a heater instead of metal, such as aluminum or the like. As disclosed therein, a ceramic substrate does not cause warping or strain even when it is made thin and can rapidly and easily conduct the temperature control, and particularly it is excellent in the responsibility when the temperature control is carried out by changing a voltage or current applied to the heating body.

With reference to the drawings in a non-limiting manner, Appellants' invention is directed to a ceramic heater comprising a disc-shaped ceramic substrate 1, as illustrated in Fig. 1 and page 26, last line, made of nitride ceramic or carbide ceramic, a heating body 2 formed on a surface of the disc-shaped ceramic substrate, such as illustrated in Fig. 2, and a surface opposite the surface having the heating body being a heating surface, which again can be seen in Fig. 2. Moreover, claim 33 further denotes that the ceramic heater is for heating a semiconductor wafer.

The heating body can comprise a sintered body of metal particles, such as disclosed as page 3, lines 27 and 28.

The heating body can comprise metal particles and metal oxide, such as disclosed at the bottom of page 3 to the top of page 4.

The metal particles can be at least one of noble metal, lead, tungsten, molybdenum and nickel, and the noble metal can be at least one of gold, silver, platinum and palladium. such as disclosed on page 4, lines 5-7 and page 19, lines 12-22.

The heating body can be covered on its surface with a non-oxidizing metal layer, such as disclosed on page 4, lines 8-10.

The heating body can have an aspect ratio at a section of the heating body of about 10 to 10,000, more preferably about 50 to 5,000, such as disclosed at page 4, lines 11-20 and page 13, lines 14-21.

The nitride ceramic can be at least one metal nitride ceramic comprising aluminum nitride, silicon nitride or titanium nitride and the carbide ceramic is at least one metal carbide ceramic

comprising silicon carbide, zirconium carbide, titanium carbide, or tungsten carbide, such as disclosed at page 10, last line to page 11, line 12.

The substrate can have a thickness of about 0.5 to 5 mm and the heating body can have a thickness of about 1 to 50 μm, preferably about 1 to 10 μm, such as disclosed at page 10, lines 25-28, and page 11, line 22 et seq.

The metal oxide can be at least one of lead oxide, zinc oxide, silicon oxide, boron oxide, aluminum oxide, yttrium oxide and titanium oxide, the metal oxide can be present in an amount more than about 0.1 weight percent of the metal particles, and the metal oxide can be present in an amount less than about 10 weight percent of the metal particles, such as disclosed on page 17, lines 14-29.

The metal particles can have an average particle size of about 0.1 to 100 μm, and the metal particles can be flaked-shaped particles or a mixture of spherical particles and flake-shaped particles, such as disclosed at page 16, lines 9-21.

The heating body can comprise tungsten, molybdenum, tungsten carbide or molybdenum carbide, such as disclosed at page 24, lines 16-22.

6. CONCISE STATEMENT OF ISSUES

(A) Whether claims 7 and 25 are properly rejectable under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as the invention.

(B) Whether claims 1, 3, 5, 26 to 28, 32 and 33 are properly rejectable under 35 U.S.C. § 103(a) as being unpatentable over Matsumura et al. (hereinafter "Matsumura"), U.S. Patent No. 5,151,871, in view of Kawanabe et al. (hereinafter "Kawanabe "), U.S. Patent No. 6,133,557, or Yoshida et al. (hereinafter "Yoshida"), U.S. Patent No. 6,080,970.

(C) Whether claims 4, 6 and 29 to 31 are properly rejectable under 35 U.S.C. § 103(a) as being unpatentable over Matsumura in view of Kawanabe or Yoshida, as applied to claims 1, 3, 5, 26 to 28, 32 and 33, and further in view of Okuda et al. (hereinafter "Okuda"), U.S. Patent No. 4,804,823.

(D) Whether claims 7 and 25 are properly rejectable under 35 U.S.C. § 103(a) as being unpatentable over Matsumura in view of Kawanabe or Yoshida, as applied to claims 1, 3, 5, 26 to 28, 32 and 33, and further in view of Kubota et al. (hereinafter "Kubota"), U.S. Patent No. 5,643,483, or Kimura, U.S. Patent No. 5,331, 134.

7. GROUPING OF CLAIMS

For each ground of rejection included in the Examiner's Final Rejection that applies to more than one claim, the rejected claims do not stand or fall together for the reasons given below.

8. **ARGUMENTS**

(A) Claims 7 and 25 are not properly rejectable under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as the invention.

In this ground of rejection, it is asserted that in claims 7 and 25 it is unclear what are compared elements for the claimed ratio.

Appellants respectfully submit that the claim terminology is not indefinite and direct attention to Appellants' originally filed specification, at page 13, lines 14 to 17, which defines the terminology. In particular, it is disclosed that:

> The aspect ratio at the section of the heating body 2 (width of the heating body/thickness of the heating body) is desirably about 10~10000, preferably 50~5000.

Moreover, this language appears in originally presented claims 7 and 25, and the claims were amended to remove the definition of the term aspect ratio in the Amendment Under 37 C.F.R. 1.111, because the term is defined in the specification. In this regard, it is noted that claims are not read in a vacuum, but are read in light of the specification.

The Examiner was requested to advise Appellants as to whether the Examiner prefers to include the definition in the claim; however, the Examiner has not made any such indication. It is therefore assumed that the Examiner deems that the claims need not explicitly include the definition in the claims, whereby this ground of rejection will apparently be withdrawn.

In any event, Appellants respectfully submit that this ground of rejection is without appropriate basis as the claims clearly and completely sets forth the metes and bounds of Appellants' invention, whereby this ground of rejection should be withdrawn.

(B) Claims 1, 3, 5, 26 to 28, 32 and 33 are not properly rejectable under 35 U.S.C. § 103(a) as being unpatentable over Matsumura in view of Kawanabe or Yoshida et al.

In this ground of rejection, it is asserted that Matsumura shows a ceramic heater having a ceramic substrate (13) with a heating body (14) formed on the surface of the ceramic substrate and a surface opposite the surface having the heating body being a heating surface.

The rejection acknowledges that Matsumura does not explicitly show a disc-shaped ceramic substrate. However, the rejection seeks to overcome this deficiency of Matsumura by relying upon either of Kawanabe or Yoshida, and asserts that each of Kawanabe and Yoshida show a ceramic heater including a disc-shaped ceramic substrate made of aluminum nitride, and that it is taught that the aluminum nitride provides a high resistance of corrosion while providing high heat resistance. The rejection concludes that in view of Kawanabe or Yoshida, it would have been obvious to one of ordinary skill in the art to adapt Matsumura with a disc-shaped ceramic substrate to accommodate and to heat uniformly a semiconductor wafer which is usually in the form of a disc.

Regarding claims 3 and 5, the rejection asserts that Matsumura shows that the heating body includes elements such as lead, tungsten, molybdenum, nickel or noble metals such as platinum or palladium. The rejection also asserts that Kawanabe also shows that a heating body is made of metal particles such as tungsten or molybdenum.

Regarding claims 27 and 28, the rejection asserts that Matsumura shows that the ceramic substrate has the thickness of 1 to 20 mm and the heating body thickness of 0.1 to 100 μm.

In response to the rejections of record, Appellants respectfully submit that their invention, as recited in independent claim 1, is directed to a ceramic heater comprising a disc-shaped ceramic substrate made of nitride ceramic or carbide ceramic, a heating body formed on a surface of the disc-shaped ceramic substrate, and a surface opposite the surface having the heating body being a heating surface. Moreover, Appellants' invention, as recited in independent claim 33, is directed to a ceramic heater for heating a semiconductor wafer comprising a disc-shaped ceramic substrate made of nitride ceramic or carbide ceramic, a heating body formed on a surface of the disc-shaped ceramic substrate, and a surface opposite the surface having the heating body being a heating surface. Accordingly, each of Appellants' independent claims includes a ceramic heater comprising a **disc-shaped nitride or carbide ceramic substrate** and a **heating body formed on a surface of the substrate opposite to a heating surface thereof**.

Because the heater according to the presently claimed invention has a disc shape, it has an effect of uniformly heating as compared with a heater having a square shape. Also, the heater according to the presently claimed invention has a substrate made of nitride or carbide ceramic so that the heat conductivity of the heater is high, and the temperature distribution on the heating surface can be made small. This can be seen from the comparison between the Example and the Comparative Example disclosed on pages 26 to 36 of Appellants' specification. In Examples 1 and 2, the temperature difference between maximum and minimum temperatures on the heating surface is 8 and 9 degrees, as seen from Table 1, while the temperature difference in Comparative Example 2, wherein the heater is made of alumina substrate is 22 degrees. Thus, in one aspect, the presently claimed invention is capable of providing a very small temperature difference on the heating surface.

In contrast to Appellants' disclosed and claimed invention, Matsumura discloses a heater in which a heating body is formed on an alumina substrate. As realized in the rejections, Matsumura does not disclose a nitride or carbide substrate as disclosed and claimed by Appellants. Moreover, Matsumura does not appear to disclose a disc shape for the upper plate 13 or the conductive thin film 14, but does indicate at column 5, lines 37-41, that the upper plate 13 has longitudinal side and transversal side each of which is in a range of 160 to 180 mm, with the conductive thin film 14 being disclosed at column 5, lines 42-45, to be formed on the whole areas of the underside of the upper plate 13. Accordingly, it would appear that these elements are square or rectangular shaped.

In an attempt to overcome the deficiencies of Matsumura, the rejection relies upon the disclosures of Kawanabe or Yoshida. However, Kawanabe and Yoshida disclose heaters wherein the heating body is embedded in the inside of the ceramic substrate. In this regard, attention is directed especially to the drawings of Kawanabe, and a description of Example 1, at column 6, line 27 et seq. wherein heating resistor 12 is disclosed as being embedded in the base body 11, and to the drawings of Yoshida, and a description of the drawings at column 4, line 16 et seq. wherein strip heating resistor 4 is buried in ceramic substrate 2. Thus, if the distance from the heating body to the heating surface is to be constant, the ceramic covering the heating body is greater in such a construction, so that there a long time to a start of a rise of temperature after the supply of power is initiated whereby the structure has a lower response time as compared to Appellants' claimed ceramic heater. Such lower response time is readily evident from the comparison between Example 1 and Example 4 as disclosed in Appellants' specification which is denoted in Table 1 on page 36 of Appellants' specification.

Still further, similar concerns are present in the case of cooling of the heater. Because the heating body is embedded in the substrate of Kawanabe and Yoshida, it is impossible to conduct a rapid cooling by blowing a cooling gas such as air. To the contrary, in the heater according to the presently claimed invention, the heating body is arranged on the surface of the substrate, so that rapid cooling can easily be attained by directly blowing air to the heating body.

Moreover, Appellants respectfully submit that one having ordinary skill in the art would not have been motivated to combine the disclosures of either of Kawanabe or Yoshida with that of Matsumura. In this regard, each of Kawanabe and Yoshida are directed to wafers and wafer holding apparatus which are structurally different from that disclosed by Matsumura. In particular, Matsumura includes an upper plate 13 and a conductive thin film 14 on the underside of the upper plate 13. In contrast, Kawanabe discloses wafers wherein heating resistor 12 is embedded in the base body 11, and Yoshida discloses a heating resistor 4 buried in the ceramic substrate 2. Thus, one having ordinary skill in the art would not have been motivated to combine the disclosure of either of Kawanabe or Yoshida with Matsumura.

However, if for the sake of argument the disclosure of either of Kawanabe or Yoshida was combined with that of Matsumura, the instantly claimed invention would not be present. In particular, any combination of the documents would not arrive at a ceramic heater comprising a disc-shaped nitride or carbide ceramic substrate and a heating body formed on a surface of the substrate opposite to a heating surface thereof.

Still further, Appellants note that the present invention resulted from a recognition by the inventors that a ceramic heater containing the presently recited materials of construction is capable

of maintaining better temperature control. If the substrate of a ceramic substrate is made too thin, the distance between the heating body and the substance to be heated becomes too close. As a result, the pattern of the heating body is reflected to the heating surface of the substrate and thus uniform heating of the wafer is impossible. The present invention solves the above drawback of reflecting the heating body pattern to the heating surface by using ceramics (nitride ceramic or carbide ceramic) which have a high thermal conductivity (thermal diffusion becomes fast). Exemplary materials of construction are AlN and SiC.

Expanding upon the above, it is noted that in order to obtain uniform heating, the present invention uses the substrate as a thermal diffusion plate by separating the heating body from the heating surface as much as possible. As a result, in one aspect of the claimed invention, the heating body is formed on a surface opposite to the support surface positioning a semiconductor wafer as the substance to be heated. That is, such an arrangement of the heating body (arranged on the surface of the substrate opposite to the heating surface) allows the substrate to be made thin, thus improving thermal diffusion, whereby the material having a high thermal conductivity can be utilized as the substrate.

As mentioned above, the present invention resides in the use of a ceramic having a high thermal conductivity, such as A1N or SiC, as the materials of construction for the substrate. As a result, in one embodiment of the present invention, the substrate itself acts as a plate for conducting thermal diffusion from the heating body to the semiconductor wafer located on the heating surface opposite to the surface provided with the heating body. In other words, according to the present invention, the thermal diffusion is excellent owing to the material having a high thermal conductivity

and the heating body is formed on the surface of the substrate opposite to the surface positioning the semiconductor wafer, so that the distance of ensuring the sufficient thermal diffusion for uniform heating or distance between the heating surface and the heating body can be ensured without thickening the ceramic substrate (as the substrate becomes thin, thermal capacity becomes small).

From the above, Appellants respectfully submit that a prima facie case of obviousness has not been established, and the rejections should be withdrawn. However, even if a prima facie case of obviousness were established in this case, the instantly claimed invention yields unexpected results sufficient to rebut a prima facie case of obviousness. In this regard, In re Soni, 34 U.S.P.Q.2d 1684, 1687-1688 (Fed. Cir. 1995), held that a showing of substantially improved results for the invention, and a statement that results were unexpected suffices to establish unexpected results absent evidence to the contrary. Id. at 1687-88. In the instant case, the superior characteristics of the claimed invention are disclosed throughout the specification, and are also shown in Table 1 on page 36 of the application.

Moreover, Appellants direct attention to the Declaration Under Rule 132 of Yasutaka Ito which was submitted with the Amendment Under 37 C.F.R. 1.116, filed September 4, 2002. This Declaration was originally prepared in view of rejections based upon Okuda, U.S. Patent No. 4,804,823, which rejections were not repeated in the Final Office Action. However, Appellants note that Kawanabe and Yoshida which are utilized in the present rejection have structures that are similar to those disclosed in the previously utilized Okuda.

Appellants note that the Declaration discusses the benefits of having a heating body arranged on the surface of the substrate as compared to the heating body being embedded therein. The

Declaration is further directed to temperature uniformity benefits associated with having a disc-shaped ceramic substrate of nitride or carbide as recited in Appellants' claims. For example, as can be seen from a review of the Declaration, it discusses that when the heating body is arranged on the surface of the substrate, the distance for thermal diffusion can sufficiently be ensured as compared with the case of embedding the heating body in the substrate, and the temperature uniformity of the heating surface is excellent. In contrast, when the heating body is embedded in the body of the substrate, the distance between the heating body and the heating surface becomes relatively small and the thermal distribution of the heating body pattern is reflected to the heating surface and hence the temperature difference of the heating surface becomes large.

Thus, Appellants respectfully submit that the only teaching or suggestion that would lead one having ordinary skill in the art to arrive at Appellants' invention is within Appellants' disclosure, and the use of such disclosure by the Examiner is improper. In order to support the conclusion that the claimed invention is either anticipated or rendered obvious over the prior art, the prior art must either expressly or inherently teach the claimed invention or the Examiner must present a convincing line of reasoning why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. Ex parte Clapp, 227 U.S.P.Q. 972 (B.O.A. 1985). There is absolutely no convincing line of reasoning present here that would lead one having ordinary skill in the art to arrive at Appellants' disclosed and claimed invention.

Additionally, each of the dependent claims is patentable over the prior art of record in view of the fact that each of these dependent claims includes the limitations of the independent claims. Moreover, each of the dependent claims is patentable over the prior art of record because it would

not have been obvious to one having ordinary skill in the art to incorporate such dependent claim features into the invention as more broadly recited in the independent claims.

In particular, claim 3 further patentably defines the invention recited in claim 1 by reciting that the heating body comprises a sintered body of metal particles. In this regard, neither of Matsumura nor Kawanabe teaches or suggests that the heating body comprises a sintered boy of metal particles as asserted in the rejection. The only teaching or suggestion to arrive at the claimed combination is in Appellants' disclosure. Claim 5 further patentably defines the invention recited in claim 3 by reciting that the metal particles are at least one of noble metal, lead, tungsten, molybdenum and nickel. Still further, claim 32 further patentably defines the invention recited in claim 5 by reciting that the noble metal is at least one of gold, silver, platinum and palladium.

Claim 26 further patentably defines the invention recited in claim 1 by reciting that the nitride ceramic is at least one metal nitride ceramic comprising aluminum nitride, silicon nitride or titanium nitride and the carbide ceramic is at least one metal carbide ceramic comprising silicon carbide, zirconium carbide, titanium carbide, or tungsten carbide. The only teaching or suggestion to arrive at the claimed combination is in Appellants' disclosure.

Claim 27 further patentably defines the invention recited in claim 1 by reciting that the substrate has a thickness of about 0.5 to 5 mm and the heating body has a thickness of about 1 to 50 μm. Moreover, claim 28 further patentably defines the invention recited in claim 27 by reciting that the heating body has a thickness of about 1 to 10 μm. The only teaching or suggestion to arrive at the claimed combination is in Appellants' disclosure.

Accordingly, the 35 U.S.C. 103 rejections should be withdrawn as improper, and all of the claims should be indicated as allowable over the prior art.

(C) Claims 4, 6 and 29 to 31 are not properly rejectable under 35 U.S.C. § 103(a) as being unpatentable over Matsumura in view of Kawanabe or Yoshida, as applied to claims 1, 3, 5, 26 to 28, 32 and 33, and further in view of Okuda.

In this ground of rejection it is asserted that Matsumura in view of Kawanabe or Yoshida discloses all of the structure claimed except the heating body having metal particles and metal oxides. To make up for this deficiency, the rejection relies upon Okuda, and asserts that Okuda shows a heating body having metal particles such as TiN or WC with metal oxides of aluminum, yttrium or magnesium, and that Okuda further teaches that the oxides can make up to 10% weight when provided with TiN or up to 40% by weight when provided with WC to adjust the resistance value and to improve the adhesion to the adhesion to the ceramic substrate.

The rejection concludes that it would have been obvious to one of ordinary skill in the art to adapt Matsumura, as modified by Kawanabe or Yoshida, with the heating body having the claimed metal particles and oxides to form a desired heating resistance while improving the adhesion of the heating body to the ceramic substrate.

With regard to claim 6, the rejection asserts that Okuda shows a non-oxidizing metal such as Ni to cover the exposed portion of heating body, and that it would have been obvious to one of ordinary skill in the art to have a non-oxidizing metal such as Ni on the exposed heating body such that when electrical terminals are attached to the heating body, it can be done without degradation if the heater is used over a long period of time.

Further, with regard to claim 30, the rejection asserts that Kawanabe shows the metal particles having the particle size of 1.0 μm, and concludes that it would have been obvious to one of ordinary skill in the art to use the metal particle size within the claimed range and shape to form a well mixed metal particles to form heating body having uniformly dispersed particles.

In response, Appellants respectfully submit that from the above, it is readily apparent that Okuda is merely utilized in the rejection of claims 4, 6 and 29-31 in an attempt to establish that it would have been obvious to one of ordinary skill in the art to adapt Matsumura as modified by Kawanabe or Yoshida with the heating body having the claimed metal particles and oxides to form a desired heating resistance while improving the adhesion of the heating body to the ceramic substrate. Appellants therefore note that Okuda does not overcome the deficiencies of Matsumura, Kawanabe and Yoshida. In this regard, Appellants note that Okuda discloses only a quadrangle-shaped heater, and not a disc-shaped heater, as recited in the present claims. Further, Okuda, at column 1, lines 5 to 10, discloses that the heater can be widely used for ordinary houses, electronic parts, industrial equipments and automobiles. The ordinary house heater is fundamentally quadrangle in shape as seen from a petroleum fan heater, air conditioner and the like. Further, the electronic parts, printed wiring boards, and LSI are fundamentally quadrangle in shape. Thus, it can be seen that the heater of Okuda is quadrangle shaped.

Still further, the stated motivation in the rejection is to achieve Appellants' invention. Certainly, this type of rejection is improper, because the motivation for combining the prior art must come from the prior art, and not from Appellants' invention. The rejection improperly does not point out the specific disclosure that is being relied upon in Okuda to support the rejection, including

where Okuda teaches or suggests a mixture of a sintered body of metal particles and metal oxide, and any motivation for providing such a mixture in a sintered body. Moreover, the rejection does not point out where Okuda teaches or suggests improving the adhesion of the heating body to the ceramic substrate.

With respect to claim 6, Appellants respectfully submit that there is no motivation in the prior art utilized in the rejection to make the indicated modified of Matsumura modified by either Kawanabe or Yoshida. Moreover, the apparent portion of Okuda referred to in the rejection appears to be at Okuda, column 7, lines 11-23, and appears to relate to terminal attachment. Accordingly, there appears to be no teaching or suggestion of the motivation asserted in the rejection relating to degradation over a long period of time, or how this relates to a combination with Matsumura modified by either Kawanabe or Yoshida.

Moreover, claim 29 further patentably defines the invention recited in claim 4 by reciting that the metal oxide is at least one of lead oxide, zinc oxide, silicon oxide, boron oxide, aluminum oxide, yttrium oxide and titanium oxide, that the metal oxide is present in an amount more than about 0.1 weight percent of the metal particles, and that the metal oxide is present in an amount less than about 10 weight percent of the metal particles.

Moreover, claim 30 further patentably defines the invention recited in claim 30 by reciting that the metal particles have an average particle size of about 0.1 to 100 μm, and that the metal particles are flaked-shaped particles or a mixture of spherical particles and flake-shaped particles. Again, the rejection makes an assertion of motivation for modifying Matsumura modified by either Kawanabe or Yoshida; however, the rejection does not point to any teaching or suggestion in the

prior art with respect to the asserted motivation. The rejection merely looks at the diverse disclosures, finds a desired disclosure in one document, and then improperly seeks to modify a combination of disclosures based upon the disclosure which was found in isolation.

Still further, claim 31 further patentably defines the invention recited in claim 4 by reciting that the heating body comprises tungsten, molybdenum, tungsten carbide or molybdenum carbide.

Accordingly, the 35 U.S.C. 103 rejection should be withdrawn as improper, and all of the claims should be indicated as allowable over the prior art.

(D) Claims 7 and 25 are not properly rejectable under 35 U.S.C. § 103(a) as being unpatentable over Matsumura in view of Kawanabe or Yoshida, as applied to claims 1, 3, 5, 26 to 28, 32 and 33, and further in view of Kubota or Kimura.

In this ground of rejection it is asserted that Matsumura in view of Kawanabe or Yoshida discloses all of the structure claimed except the claimed ratio. To make up for this deficiency, the rejection asserts that Kubota or Kimura shows the cross-sectional of the heating body having the claimed ratio of 2000 and 180, and concludes that, in view of Kubota or Kimura, it would have been obvious to one or ordinary skill in the art to provide the ratio within the claimed range so that the heating body is set to a desired electrical resistance to generate the desired heating temperature uniformly along the heating surface.

In contrast to the assertions in the rejection, Appellants respectfully submit that each of Kubota and Kimura are merely utilized in the rejection of claims 7 and 25 in an attempt to establish the obviousness of the claimed aspect ratio. However, whether or not these references teach or suggest such an aspect ratio, the references do not overcome the above-noted deficiencies of

Matsumura, Kawanabe and Yoshida, whereby the rejection of claims 7 and 25 is without appropriate basis, and should be withdrawn.

Moreover, Appellants respectfully submit that one having ordinary skill in the art would not have been motivated to apply the disclosures of the specific examples of Kubota and Kimura to the disclosure of Matsumura modified by either of Kawanabe or Yoshida. In this regard, while Kubota discloses an aspect ratio of 10mm/25μm = 2000 and Kimura discloses an aspect ratio of 9mm/25μm = 380 [as compared to 180 as indicated in the rejection], there is no teaching or suggestion of importance of these ratios in either of Kubota or Kimura, whereby one having ordinary skill in the art would not have been motivated to combine such disclosure with the modified disclosure of Matsumura.

Thus, Appellants respectfully submit that the rejection of claims 7 and 25 is without appropriate basis, and should be withdrawn.

9. CONCLUSION

For the reasons set forth above, it is respectfully submitted that the Examiner has failed to establish a prima facie case of obviousness, which is a prerequisite for maintaining a rejection under 35 U.S.C. § 103(a). The Board is, therefore, respectfully requested to reverse the Final Rejection, and to allow the application to issue in its present form.

Respectfully submitted,
Masakazu FURUKAWA, et al.

Bruce H. Bernstein
Reg. No. 29,027

Reg. No. 33,094

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APPENDIX
COPY OF REJECTED CLAIMS 1, 3-7 AND 25-33

1. A ceramic heater comprising:

a disc-shaped ceramic substrate made of nitride ceramic or carbide ceramic,

a heating body formed on a surface of the disc-shaped ceramic substrate, and

a surface opposite the surface having the heating body being a heating surface.

3. The ceramic heater according to claim 1, wherein the heating body comprises a sintered body of metal particles.

4. The ceramic heater according to claim 1, wherein the heating body comprises metal particles and metal oxide.

5. The ceramic heater according to claim 3, wherein the metal particles are at least one of noble metal, lead, tungsten, molybdenum and nickel.

6. The ceramic heater according to claim 1, wherein the heating body is covered on its surface with a non-oxidizing metal layer.

7. The ceramic heater according to claim 1, wherein the heating body has an aspect ratio at a section of the heating body of about 10 to 10,000.

25. The ceramic heater according to claim 7, wherein the aspect ratio is about 50 to 5,000.

26. The ceramic heater according to claim 1, wherein the nitride ceramic is at least one metal nitride ceramic comprising aluminum nitride, silicon nitride or titanium nitride and the carbide ceramic is at least one metal carbide ceramic comprising silicon carbide, zirconium carbide, titanium carbide, or tungsten carbide.

27. The ceramic heater according to claim 1, wherein the substrate has a thickness of about 0.5 to 5 mm and the heating body has a thickness of about 1 to 50 μm.

28. The ceramic heater according to claim 27, wherein the heating body has a thickness of about 1 to 10 μm.

29. The ceramic heater according to claim 4,

wherein the metal oxide is at least one of lead oxide, zinc oxide, silicon oxide, boron oxide, aluminum oxide, yttrium oxide and titanium oxide,

wherein the metal oxide is present in an amount more than about 0.1 weight percent of the metal particles, and

wherein the metal oxide is present in an amount less than about 10 weight percent of the metal particles.

30. The ceramic heater according to claim 4,

wherein the metal particles have an average particle size of about 0.1 to 100 μm, and

wherein the metal particles are flaked-shaped particles or a mixture of spherical particles and flake-shaped particles.

31. The ceramic heater according to claim 4, wherein the heating body comprises tungsten, molybdenum, tungsten carbide or molybdenum carbide.

32. The ceramic heater according to claim 5, wherein the noble metal is at least one of gold, silver, platinum and palladium.

33. A ceramic heater for heating a semiconductor wafer comprising:

a disc-shaped ceramic substrate made of nitride ceramic or carbide ceramic,

a heating body formed on a surface of the disc-shaped ceramic substrate, and

a surface opposite the surface having the heating body being a heating surface.

APPENDIX
COPY OF NON-ELECTED CLAIMS 2 AND 14-18

2. The ceramic heater according to claim 1, wherein the heating body is arranged so as to embed a part thereof in the ceramic substrate.

14. A method of producing a ceramic heater according to claim 1, the method comprising:

sintering nitride ceramic powder or carbide ceramic powder to form the substrate made of nitride ceramic or carbide ceramic;

printing an electrically conductive paste on the substrate; and

sintering the electrically conductive paste by heating to form the heating body on the surface of the ceramic substrate.

15. The method according to claim 14, wherein the electrically conductive paste is a mixed paste of metal particles and metal oxide.

16. The method according to claim 14, further comprising plating a non-oxidizing metal onto the surface of the resulting heating body.

17. A method of producing a ceramic heater which comprises at least following steps①~④:

① step of shaping nitride ceramic powder or carbide ceramic powder to form a green sheet made of nitride ceramic or carbide ceramic;

② step of printing an electrically conductive paste of metal particles alone or a mixture with a metal oxide thereof on the surface of the green sheet made of the nitride ceramic or carbide ceramic;

③ step of laminating the green sheet printed with the electrically conductive paste on one or more of another green sheet obtained by the same treatment as in the step ①; and

④ step of sintering the green sheets and the electrically conductive paste by heating under pressure.

18. The method according to claim 17, wherein when the green sheets obtained by the same treatment as in the step ① are laminated on the upper side and lower side of the green sheet printed with the electrically conductive paste in the step ②, the number ratio of the upper and lower green sheets is within a range of 1/1 to 1/99.